Periodicum Biologorum 2016 vol.118 N3, pages 273-280

Body size variation of ground beetles (Coleoptera: Carabidae) in latitudinal gradient

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Abstract

© 2016, Croatian Society of Natural Sciences. All rights reserved.Background and purpose: Despite plenty of data, papers on latitudinal intraspecific body size variation in insects are scarce and in Ground Beetles are absent at all. The aim of this research was to: (i) model the effect of the latitude into the body size variations in widespread carabid species; (ii) describe elytra length variation and body shape variation in latitude gradient in studied species of Ground Beetles. Material and methods: Six carabid species from different provinces of Russia (situated on different latitudes) were analyzed for six morphometric traits. We used linear models to quantify contribution of provinces latitude to traits variation. We applied relative warp analysis (a principal component analysis of the weight matrix) when analyzing effect of latitude on body shape deviation in studied carabid species. Results: Different traits of certain species varied in differing ways under the influence of the same environmental factor. In three Carabus species and Pterostichus niger elytra length decreased towards the high latitudes, Pterostichus melanarius demonstrated saw-tooth elytra length variation in latitude gradient and Poecilus cupreus-the counter-gradient one. Conclusion: Closely related species of carabids could act very differently, each individual species following or countering Bergmann's rule in its own way. Explanation that takes into account the natural history, climatic correlations and sexual size dimorphism is needed to assess the observed contrasting geographic patterns and differences between species, morphometric traits and sexes, since size clines (e.g. Bergmann's clines) may obey to multiple selection pressures.

http://dx.doi.org/10.18054/pb.2016.118.3.3918

Keywords

Carabids, Converse bergmann's clines, Counter-gradient variation, Environmental factors, Linear models, Saw-tooth variation, Voice-counting method